

1854, at 9^h 30^m Madras Mean Time; the other represents its appearance on the 23d of March, 1854, at 6^h 54^m. The drawing of *Saturn* refers to the appearance of the planet on the 15th of November, 1852. The transparency of the obscure ring which was first remarked by Captain Jacob and Mr. Lassell, independently of each other, is very clearly exhibited in this drawing. The drawings of both planets have been engraved at the expense of the Court of Directors of the East India Company, who have liberally distributed copies of them to the Fellows of the Society and other persons interested in the subject of such delineations. A few copies still remain for distribution, which may be obtained by applying at the Apartments of the Society.

Suggestions respecting the Origin of the Rotatory Movements of the Celestial Bodies and the Spiral Forms of the Nebulae as seen in Lord Rosse's Telescopes. By James Nasmyth, Esq.

"What first set me thinking on this subject was the endeavour to get at the reason why water in a basin acquires a rotatory motion when a portion of it is allowed to escape through a hole in the bottom: Every well-trained philosophical judgment is accustomed to observe illustrations of the most sublime phenomena of creation in the most minute and familiar operations of the Creator's laws, one of the most characteristic features of which consists in the absolute and wonderful integrity maintained in their action whatsoever be the range as to magnitude or distance of the objects on which they operate.

"For instance, the minute particles of dew which whiten the glass-blade in early morn are, in all probability, moulded into spheres by the identical law which gives to the mighty sun its globular form!

"Let us pass from the rotation of water in a basin to the consideration of the particles of a nebulous mass just summoned into existence by the fiat of the Creator,—the law of gravitation coexisting.

"The first moment of the existence of such a nebulous mass would be inaugurated by the election of a centre of gravity, and, instantly after, every particle throughout the entire mass of such nebulae would tend to and converge towards that centre of gravity.

"Now let us consider what would be the result of this. It appears to me that the inevitable consequence of the convergence of the particles towards the centre of gravity of such a nebulous mass would not only result in the formation of a nucleus, but by reason of the physical impossibility that all the converging particles should arrive at the focus of convergence in directions perfectly radial and diametrically opposite to each other, however slight the degree of deviation from the absolute diametrically opposite direction in which the converging particles coalesce at

the focus of attraction, a twisting action would result, and rotation ensue, which, once engendered, be its intensity ever so slight, from that instant forward the nucleus would continue to revolve, and all the particles which its attraction would cause to coalesce with it, would do so in directions tangential to its surface, and not diametrically towards its centre. In due course of time the entire of the remaining nebulous mass would become affected with rotation from the more rapidly moving centre, and would assume what appears to me to be their inherent normal condition, namely, spirality, as the prevailing character of their structure; and as that is *actually* the aspect which may be said to characterise the majority of those marvellous nebulae, as revealed to us by Lord Rosse's magnificent telescope, I am strongly impressed with the conviction that such reasons as I have assigned have been the cause of their spiral aspect and arrangement.

"And by following up the same train of reasoning, it appears to me that we may catch a glimpse of the primeval cause of the rotation of every body throughout the regions of space, whether they be nebulae, stars, double stars, or planetary systems.

"The primary cause of rotation which I have endeavoured to describe in the preceding remarks is essentially cosmical, and is the direct and immediate offspring of the action of gravitation on matter in a diffused, nebulous, and, as such, highly mobile condition.

"It will be obvious that in the case of a nebulous mass, whose matter is unequally distributed, that in such a case several sub-centres of gravity would be elected, that is to say, each patch of nebulous matter would have its own centre of gravity; but these in their turn subordinate to that of the common centre of gravity of the whole system, about which all such outlying parts would revolve. Each of the portions above alluded to would either be attracted by the superior mass, and pass in towards it as a *wisp* of nebulous matter, or else establish perfect individual and distinct rotation within itself, and finally revolve about the great common centre of gravity of the whole.

"Bearing this in mind, and referring to some of the figures of the marvellous spiral nebulae which Lord Rosse's telescope has revealed to us, I shall now bring these suggestions to a conclusion. I have avoided expanding them to the extent I feel the subject to be worthy and capable of; but I trust such as I have offered will be sufficient to convey a pretty clear idea of my views on this sublime subject, which I trust may receive the careful consideration its nature entitles it to. Let any one carefully reflect on the reason why water assumes a rotatory motion when a portion of it is permitted to escape from an aperture in the bottom of the circular vessel containing it; if they will do so in the right spirit, I am fain to think they will arrive at the same conclusion as the contemplation of this familiar phenomenon has brought me to.

"*Bridgewater Foundry, June 7, 1855.*"